

PROFIT MAXIMIZATION OF POWER GENERATION COMPANIES IN COMPETITIVE ELECTRICITY MARKET

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Abstract

In the competitive electricity market, Power Generation companies (GENCOs) and large consumers are participating in bidding methodologies for their own benefits. In oligopoly market structure, GENCOs tries to maximize their profit and minimize the risk factor. So it is very essential and important for the GENCOs to formulate optimal bidding strategies before entering into the electricity market to achieve a maximum profit, since the market clearing price (MRP) are variable in nature. In this paper an innovative approach for defining optimal bidding strategy is presented as a stochastic optimization problem and solved by Firefly algorithm.(FA). The Firefly Algorithm is a Meta heuristic, nature inspired, optimization algorithm which is based on the social flashing behavior of fireflies and has been introduced for the bidding problem to obtain the global optimal solution. The proposed Firefly algorithm effectively maximizes the GENCOs profit. The proposed Firefly algorithm effectively maximizes the GENCOs profit. A numerical example with six suppliers is considered to illustrate the essential features of the proposed method and test results are tabulated. The simulation result shows that these approaches effectively maximize the Profit of GENCOs, converge much faster and more reliable when compared with existing methods.

Keywords: *Electricity market, Optimal bidding, Profit maximization, Firefly algorithm..*

1. INTRODUCTION

The deregulation of the power industry across the world has greatly increased market competition by reforming the traditionally integrated power utility into a competitive electricity market, which essentially consists of the day-ahead energy market (Mohammad Shahidehpour, *et al* 2000), real-time energy market and ancillary services market. Therefore, in a deregulated environment, GENCOs are faced with the

problem of optimally allocating their generation capacities to different markets for profit maximization purposes. Moreover, the GENCOs have greater risks than before because of the significant price volatility in the spot energy market introduced by deregulation

Bidding strategies are essential for maximizing profit and have been extensively studied (Dhanalakshmi, S *et al*